CONFERENCES - MYCOLOGICAL ...

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PROCEEDINGS

OF THE

MYCOLOGICAL CONFERENCE

Held at Pusa on the 5th February 1917
and following days

CALCUTTA
SUPERINTENDENT GOVERNMENT PRINTING, INDIA
1917

Price, As.2 or 2*d*.

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PREFACE.

IN accordance with the proposal of the Government of India to adopt the policy of holding Sectional Meetings in years in which a full meeting of the Board of Agriculture is not held, a Conference of Mycologists and Entomologists met at Pusa on the 5th February, 1917, and following days. It was attended by representatives of nearly all provinces, the Native State of Mysore and the officers of the Indian Tea Association. On the opening day of the Conference a combined meeting was held, and after some questions of general policy had been discussed in full session, the Conference broke up into two Sections, *viz.*, Mycological and Entomological, for the discussion of special subjects.

A brief summary of the proceedings of the Mycological Section is printed in this bulletin. A full report of the proceedings of the Entomological Section is being printed separately in the form of a book. It was hoped to print both proceedings together, but it was found that, to be of any use, the proceedings of the Entomological Section had to be in great detail, and the compilation of these has much delayed the issue of both sets of proceedings.

J. MACKENNA,
Agricultural Adviser to the Government of India.

PUSA,
1st August 1917.

PROCEEDINGS

OF THE

Mycological Conference held at Pusa on the 5th February, 1917, and following days.

A combined meeting of mycologists and entomologists was held on the 5th February, 1917, when the Conference was opened by Mr. J. Mackenna, M.A., I.C.S., who in his introductory speech, said :—

" Dr. Butler, Mr. Fletcher and Gentlemen,

" I desire to extend to you a hearty welcome to Pusa. In the first place I have much pleasure in reading the following letter which I have just received from the Hon'ble Sir Claude Hill, Member in charge of the Department of Revenue and Agriculture :—

' I am sorry that I shall not be able to be present at your Sectional meeting of mycologists and entomologists to be held at Pusa on the 5th of February, but it is quite impossible for me to get away from Delhi at the present time. This meeting is the first of the Sectional meetings which we hope to develop with your assistance and it will, I hope and feel sure, be the precursor of many future valuable meetings of other branches also of the Department. The ordinary Board meetings, which are held every other year—though we hope perhaps to organize more frequent meetings—require supplementing by Sectional meetings such as the one you are about to hold and I am not sure that these Sectional meetings are not likely to prove even more valuable in their way than the general Board meetings.

At all events, I feel quite sure that the mycologists and entomologists, who will meet you at Pusa on the 5th, are inaugurating a system of very great value. Just as is the case in every other branch of our work, we are, of course, under-staffed, but, to a very large extent, I think that the shortage of men is made up by the zeal of the individual workers in these and other scientific branches, and it would have been a very great pleasure to me if I could have been present to inaugurate this pioneer meeting. Will you please express to the members attending the meeting my personal regret at not having the pleasure of seeing them and my best wishes for the success of their deliberations.'

"There is a general feeling that in addition to the ordinary meetings of the Board of Agriculture which are held every second year it will be of the greatest advantage if workers on particular subjects can have more frequent opportunities of conferring with each other. The Government of India propose to adopt the policy of Sectional meetings in years in which a full meeting of the Board of Agriculture is not held. As you are aware, Mr. Bainbrigge Fletcher two years ago held a meeting of entomological workers and as the working out of the details of Sectional meetings will take some time, it was felt that this year the wishes of the Government of India could best be given effect to by a development of this idea and by calling meetings of two branches which, though of great importance, are not particularly strongly manned. It seemed desirable that this handful of scattered workers should be called together to discuss their difficulties and co-ordinate their work.

"In addition to some questions of general policy which will be discussed by the two sections sitting together, Dr. Butler

and Mr. Fletcher will arrange for the discussion of subjects of a technical nature connected peculiarly with their own branches of science.

"I am very glad to see such a representative gathering of mycologists and entomologists. I trust that you will have a very pleasant time at Pusa and that the results of your deliberations will not only be of great advantage to yourselves but of considerable assistance to the Government of India. Mycology and Entomology are represented in India by a mere handful of workers but I think, I may safely say that proportionate to their numbers, their achievement has been great. In both branches you are battling against enormous difficulties and innumerable pests. The labourers in these fields of science are indeed few, but I think you have every cause to congratulate yourselves on the impression which has already been made on the suppression and control of fungoid and insect pests. I trust you will have very successful meetings and that as a result you will return to your respective provinces equipped with new ideas and with a new stimulus to increased endeavour."

Dr. Butler and Mr. Fletcher explained the programme of work for the meetings and the Sections then adjourned to take up special subjects.

The Mycological Section of the Conference met for the first time at 9 A.M. on February 6th, 1917, Dr. Butler in the chair.

The following members were present:—

Dr. E. J. BUTLER, M.B., F.L.S., Imperial Mycologist, Pusa.

* DR. L. C. COLEMAN, M.A., Director of Agriculture, Mysore.

* Mr. R. D. ANSTEAD, Deputy Director of Agriculture, Planting Districts, Madras.

* Joined Mycological Conference from the second day.

Mr. W. MacRae, M.A., B.Sc., Government Mycologist, Madras.
Dr. F. J. F. Shaw, D.Sc., A.R.C.S., F.L.S., Second Imperial Mycologist.
* Mr. W. Robertson Brown, Agricultural Officer, North-West Frontier Province.
Mr. A. C. Tunstall, B. Sc., Mycologist, Indian Tea Association.
Mr. S. K. Basu, M.A., Assistant Professor of Mycology, Bihar and Orissa.
Mr. S. L. Ajrekar, B.A., Assistant Professor of Mycology, Agricultural College, Poona.
Mr. G. S. Kulkarni, L. Ag., Assistant Mycologist, Bombay.
Mr. S. Sundararaman, M.A., Assistant in Mycology, Madras.
Mr. K. P. Shrivastava, Assistant Economic Botanist, Central Provinces.
Mr. A. L. Som, Mycological Collector, Bengal.
Mr. J. F. Dastur, B.Sc., First Assistant to the Imperial Mycologist.
Mr. S. N. Mitra, Second Assistant to the Imperial Mycologist.
Munshi Inayat Khan, Assistant to the Imperial Mycologist.
Mr. L. S. Subramanium, Assistant to the Imperial Mycologist.
Mr. R. R. Sen, Fieldman, Mycological Section, Pusa.
Mr. P. C. Kar, Fieldman, Mycological Section, Pusa.
Muhammad Taslim, Fieldman, Mycological Section, Pusa.
Babu N. N. Mukerji, Fieldman, Mycological Section, Pusa.

The Chairman, said that he proposed that the meeting should consider the mycological work done in India, province by province, and he asked Mr. Basu, Assistant Professor of Mycology, Sabour, to commence with an account of the mycological work done in Bihar and Orissa.

Mr. Basu explained that the work in Bihar and Orissa had in the past been greatly hampered by the paucity of the staff. He worked under the Economic Botanist and at present that officer was on military duty and moreover the only mycological fieldman in the province was on six months' sick leave. Even when the Economic Botanist was on duty his (Mr. Basu's) time was largely taken up with non-mycological work—botanical and administrative. Still he had been able to carry out some investigations on potato blight, sugarcane smut and a plantain disease, the results

*Joined on fifth day.

of which had been published in the Quarterly Journal of the Department. He had also assisted in preparing the Crop-Pest Handbook for the province. He would recommend that there should be a research mycologist in the Imperial Service with one assistant in the Provincial Service and three subordinates for research and field work and a teaching mycologist in the Provincial Service with two other subordinates to assist in teaching.

Dr. Butler asked whether Mr. Basu could give the meeting any idea of the amount of research work which was waiting to be done in Bihar and Orissa and whether it was sufficient to justify such a large increase in staff.

Mr. Basu said that he could not give the meeting such information. He had no information of the extent of fungal diseases in Bihar and Orissa—there was nobody on his staff to go out and make collections of diseased crops.

In reply to the Chairman, Mr. Basu stated that the district agricultural officers did not send him specimens; he only got about one dozen in a year; he considered that there should be a mycological collector in each district to do such work.

Dr. Butler pointed out that such collectors would collect all available material in the first three years and would then have nothing much to do. He suggested that such work might properly fall on district agricultural officers.

Mr. Kulkarni, Mycological Assistant, Bombay, stated that this was done to a considerable extent in Bombay and that diseased specimens were also sent in by the generalpublic. Mr. Shrivastava, Assistant Economic Botanist, Central Provinces, said that it was done also in the Central Provinces.

Mr. Som, Mycological Collector, Bengal, said that the district officers in Bengal very rarely sent in any specimens of diseased crops. The instructions given to the agricultural staff by Mr. Blackwood, formerly Director of Agriculture, were that demonstrators should report the outbreak of a disease to district officers

and district officers should transmit the report to divisional superintendents and divisional superintendents should forward it to Deputy Directors who could then send it on to the Economic Botanist.

The Chairman then said that the meeting would proceed to consider the mycological work done in Bengal, and would leave such general questions as that last raised until the experience of other provinces had been obtained. The staff in Bengal consisted of one Mycological Collector under the Economic Botanist—research work on crop diseases had in the past been carried out at Pusa .The most important investigation was that on the *ufra* disease of paddy. He gave a brief account of the present state of the work, and dwelt particularly on the necessity for close co-operation with the district agricultural staff in carrying out the remedial measures advocated. He thought that such measures should be regarded as improvements in ordinary agricultural practice of the same order of importance as the use of improved seed, manuring and the like. Unless this point of view was accepted, the work would have to be carried out by a special mycological staff, who might be slower in gaining the confidence of the cultivators as they would have a less varied chance of proving their value than the local agricultural officers had.

Experiments conducted by Mr. Finlow had shown that the incidence of *Rhizoctonia* upon jute was lessened by heavy applications of manure. The correlation of the incidence of a fungal disease with the deficiency of some essential element in the soil was a matter of great interest and other facts bearing upon this problem were known. In Ranchi the *tikka* disease of groundnut was most severe on those soils which were low in phosphate content, and the root rot of cotton in the Punjab seemed also to have some connection with the chemical composition of the soil.

The Chairman then explained that there was no mycological staff in the United Provinces or Punjab and, as no representative had attended, it was difficult to give an account of their problems. Possibly the dry hot climate of these areas was against the prevalence of fungus diseases. The field crops suffered from the ordinary diseases,

such as rust of wheat, *arhar* (*Cajanus indicus*) wilt and the like, and the opium poppy blight was engaging the attention of the Economic Botanist, United Provinces. The Economic Botanist, Punjab, was also interesting himself in several diseases. Much, however, still remained to be done before any estimate could be formed of the amount of preventable loss caused by fungus diseases in this area.

The Chairman next asked Mr. Shrivastava, Assistant Economic Botanist, Central Provinces, if he could tell the meeting anything about the mycological work done in the Central Provinces.

Mr. Shrivastava said that the district staff sent in a number of specimens and the Economic Botanist referred a number of these to Pusa. There was no special mycological staff in the province. Treatment of *jowar* (*Andropogon Sorghum*) smut with copper sulphate on the lines carried on in Bombay was proceeding, the work being done by the agricultural officers with success.

The Chairman then asked the representatives of the Bombay Department to give some account of the mycological work in that province.

Mr. Ajrekar, Assistant Professor of Mycology, said that he was in charge of the mycological teaching, which left him a certain amount of time available for research. He had no assistant to help him and thought he should have a demonstrator and a laboratory assistant ; he thought that teaching work should not be entirely dissociated from research. The district agricultural officers sent in specimens, but they had many other duties, and they were not always competent to make reliable observations on plant disease or to superintend operations for its control. He considered that there should be one or two mycological assistants who could be sent to collect information when he was engaged in teaching and could not leave the College. He was engaged personally on research work on ergot of *jowar*, *Ustilaginoidea* of rice and *Nectria* on citrus. He believed that in sugary disease of *jowar* the *Cerebella* and *Sphacelia* stages were connected and the former probably corresponded to the ergot stage of *Claviceps*. The *Nectria*

disease of citrus had been successfully prevented by spraying with Bordeaux mixture and resin, but artificial infections had not succeeded. The "band" disease of betelnuts and "katti" disease of cardamoms were under investigation. Other diseases of importance which were under observation were scab of citrus, mildew on cumin, storage rots of potato, obscure diseases of cotton and solanaceous crops similar to leaf curl, and *Fomes* on coconut.

Mr. Kulkarni, Mycological Assistant, said that the following diseases were being combated in the field :—

(1) *Smut of cereals—Jowar* and *rala* (*Setaria italica*). This smut was due to the fungi *Sphacelotheca Sorghi* and *Sph. cruenta* on *jowar* and *Ustilago Crameri* on *rala*. A description of the disease and its method of control was being published. The disease was controllable by immersing the seed in copper sulphate before sowing. He started the campaign in 1911 in different centres in Satara and Belgaum districts and 17 villages were visited and seed for 10,000 acres was treated free of charge. The crop obtained from the area sown with the treated seed was free from the disease, and at harvest time he collected cultivators in the fields and the efficacy of the treatment was shown to them. In 1912 the work was handed over to the district agricultural staff and work was extended to over 150 villages. In order to cope with the increasing demand for copper sulphate in consequence of the success of the treatment, arrangements were made with a private firm to place on the market packets of copper sulphate. These packets were sold at 1 anna each and contained sufficient copper sulphate to treat seed for four acres, together with instructions in all vernaculars and in English ; over 43,000 of these packets were sold in 1915-16, and the distribution of copper sulphate was now one of the regular duties of the district

agricultural staff. He calculated that 10,00,000 rupees had been saved to the cultivators by this work.

(2) *Grapevine mildew.* The control of grapevine mildew by spraying with Bordeaux was commenced in 1909 in Nasik and Poona and was successful. After four years the work was handed over to the district agricultural officers but did not succeed under their supervision and was taken over again by the mycological staff. The people pay expenses themselves and merely get guidance from the mycological staff. The treatment is now pretty general.

(3) *Koleroga disease of areca-nuts.* This campaign was carried on on the same lines as in Mysore. The people are now paying for work themselves and purchasing sprayers —for the first three years expenses were defrayed by Government. The campaign was proving quite successful.

(4) *Red rot of sugarcane.* A survey of the disease was made in the Presidency and in localities where it was severe, work was started to teach people to use sound setts. A small nursery has now been started for distribution of sound setts.

The Chairman pointed out that the moral to be drawn from the highly successful operations carried out in the field in Bombay was that it was of the first importance to select certain definite diseases for attack in order to secure the confidence of the people and to get early and definite results. It was not always possible to entrust mycological operations in the field to district agricultural officers; while these officers were carrying on the campaign against smut of *jowar* with success, they had not been successful in the spraying against grapevine mildew and this work had to be resumed by the mycological staff. The reasons for this seemed to be chiefly connected with the technical nature of the work required to be done.

The meeting adjourned at 12 o'clock.

The second meeting of the Mycological Conference was held at the Mycological Laboratory at 2 o'clock, when the members of Pusa staff were engaged in showing to their visitors from the provinces the various lines of mycological research in progress in the Pusa Institute.

The third meeting of the Mycological Conference was held at 9 A.M., on February 7th, Dr. Butler in the chair. The same members attended as at the first meeting and in addition Dr. L. C. Coleman, Director of Agriculture, Mysore, and Mr. R. D. Anstead, Deputy Director of Agriculture for Planting Districts, Madras, were present. Mr. McRae, Government Mycologist, Madras, was asked by the Chairman to give some account of the work in his province.

He said that the most important work in his province was connected with the various palm diseases.

(1) *Bud rot of palmyra palm in the Godavari Delta.* The process of cutting and burning diseased palms was proceeding through the agency of a special staff of revenue officials. These officers were hampered in their operations by the fact that they had no powers of compulsion. He considered that there should be power to compel ryots to cut and burn diseased trees. The work had recently been improved by introducing the practice of examining trees and removing diseased leaves—trees treated in this manner recovered from the disease.

The Chairman asked whether Mr. McRae thought that the total amount of disease had been decreased by the operations. Was it ever likely to be possible to abandon the operations and if the operations had to be continued indefinitely, was it a paying proposition from the point of view of value of palms saved ?

Mr. McRae pointed out that in estimating the extent of disease it was necessary to consider the extension which would have taken place had no operations been instituted. The cost of the operations should be compared with the probable loss in the absence of such operations. Thus considered there was no doubt they were paying

for themselves. It was probably too early yet to express an opinion as to how long they should continue.

(2) *Koleroga of areca-nuts.* Mr. McRae then explained the operation in progress against "koleroga" of areca-nuts in Malabar. The work proceeded on the same lines as that in Mysore. Cultivators were now satisfied of the efficacy of the treatment and some sprayers, about 15, had been sold and further orders could not be met owing to shortage of sprayers in India. The work has now been handed over to the district agricultural officers.

An abnormal leaf-fall disease of rubber on the West Coast was being investigated. It was probably due to a species of *Phytophthora.* An experiment was in progress on four blocks of 100 acres each in widely separated parts of the rubber growing area to see whether the incidence of this disease could be lessened by collecting and burning diseased fruits and twigs. Accounts of the work would be published in due course.

Grapevine mildew in Salem was under observation and spraying operations had been started.

Spraying of chillies against anthracnose had been instituted in Taliparamba Farm and work was proceeding. Treatment of *cholam* (*Andropogon Sorghum*) smut with copper sulphate in the Ceded Districts was proceeding; this work was being done by the district staff under mycological supervision. Spraying against brown blight of tea had been carried out successfully in certain estates in the Wynaad and against apple mildew and *Cercospora* on *Eucalyptus* in the Nilgiris.

The meeting was adjourned till 1-30 P. M.

At 1-30 P.M. Dr. Coleman gave an account of the work in Mysore.

(1) *Koleroga of areca-nuts.* The most important work was the spraying against "koleroga" of areca-nuts. The life-history of this disease had been worked out in Mysore 10 years ago and remedial measures were first started there. The work was under the control of a member of his mycological staff; this officer was brought into constant touch with cultivators in the diseased areas and now had considerable influence with them. An experiment

was in progress to see whether the disease could be completely exterminated in an isolated garden.

(2) *Spike disease of sandal wood.* Research work was in progress on spike disease of sandal wood. Experiments were being carried out to see whether the disease was communicable in the expressed sap of a diseased plant.

The difficulty of obtaining sprayers at present had led him to make arrangements for their local manufacture; it was impossible to say whether this would be a success.

Research work was in progress on *Pellicularia* on coffee. The fertile stages of this fungus had been discovered and proved to be of the *Hypochnus* type. The manner in which the parasite damaged the coffee leaf was obscure and experiments on this point were in progress.

Dr. Butler then suggested that the meeting should proceed to consider the diseases of tea.

Diseases of Tea. Mr. Anstead gave some account of the mycological troubles of tea in South India. He considered that grey blight was not such a serious pest as brown blight. The atter had been successfully controlled by a combination of spraying with Bordeaux and hand-picking the diseased leaf, both in nursery and field.

Mr. Tunstall said that the most serious leaf disease in the tea districts of North-East India was blister blight. The spraying of this disease was discussed and it was pointed out that it was a very suitable one for the application of a Pest Act such as that prepared by the Madras Government. The co-operation of all gardens in certain districts was essential for successful treatment of this blight and could not be secured in any other way. Some other leaf diseases, such as brown blight, were especially bad on deteriorated soils, such as old *bheels*. The root diseases were also often markedly connected with soils, brown root disease occurring chiefly on sandy soil, *Diplodia* on cleared grass land, and so on. The recent discovery of *Sphaerostilbe repens* and *Rosellinia bothrina*

as tea root diseases in Assam was described, and the class of assistance required from Pusa in work of this kind was discussed. Both these diseases were identified at Pusa and other critical work on copper blight and grey blight was in hand with assistance from Pusa. The fact that *Rosellinia* occurs chiefly on acid soils and the use of lime against this root pest were commented on. This led to a general discussion on spraying for tea and coffee leaf diseases. Mr. Tunstall stated that in spraying tea a type of nozzle was required which would produce a fine spray at a relatively short distance. He also favoured any system of spraying which would relieve the spraying coolie from the burden of giving individual attention to bushes. The man should be able to walk straight down between the lines spraying bushes on either side, he should have control of more than one nozzle; the improvement of machines in this direction was necessary and this would lessen cost of labour. Mr. Anstead, Mr. McRae and Dr. Coleman referred to the extension of spraying in tea and coffee in South India. *Pellicularia* on coffee was being successfully treated and spraying for coffee leaf disease was hopeful.

Mr. Tunstall said that the proprietary mixture "Bordorite" had given some satisfactory results on tea, it usually kept well but occasionally failed and should be used within three months of manufacture. Other members proposed to try it.

Dr. Coleman proposed a vote of thanks to Dr. Butler and his staff for the very interesting series of meetings which had been held.

The fourth meeting of the Mycological Conference was held in the laboratory on Thursday morning (February 8th) at 9 A.M., when a detailed discussion of various crop pests illustrated by specimens in the Pusa collection and brought to Pusa by members took place. All the members attended,

A combined Entomological and Mycological Committee met in the afternoon with Mr. Mackenna in the chair to consider the Madras Agricultural Pests and Diseases Act.

The fifth meeting of the Mycological Conference took place on Friday morning (February 9th) at 9 A.M. in the laboratory. All the members attended and the discussion of crop diseases was continued. A particularly interesting discussion on pink disease was started by Mr. Anstead and on black thread and leaf-fall of rubber by Messrs. McRae and Dastur. Diseases of fruit trees and field crops occupied the rest of the time.

A combined mycological and entomological meeting to consider the Rome Phytopathological Conference was held in the afternoon.

Dr. Butler explained that he had hoped to have copies of a Memoir he had written on the subject, available for members, but the press had not been able to deliver them in time. The subject was one of considerable interest, though any practical outcome from the Conference would necessarily be postponed until after the war. Some 30 States and Colonies sent their phytopathological and diplomatic representatives to Rome early in 1914 and an International Convention for the control of the inter-state circulation of certain classes of nursery and horticultural stock was drawn up and signed by all the delegates. The States concerned had for the most part not ratified the Convention owing to the war, but the matter was sure to be taken up again, and meanwhile we had an opportunity of making up our minds on the subject, after examining how the proposed Convention would affect India. Adhering States were required to set up a Government Phytopathological Service for the inspection of nurseries engaged in the export of horticultural produce and at the same time pledged themselves not to admit within their frontiers any such produce unless it carried certificates

of inspection by the officers of the Phytopathological Service of the country of origin. These certificates would state that the produce was in a satisfactory sanitary condition and was free from any disease or pest mentioned in a list which each adhering country would draw up. No country was prevented from making any other regulations, but he assumed that no country could refuse entry to a properly certified consignment. There were various restrictions as to the pests that a country could list and others securing the liberty of action of licensed scientific institutions. Imports from non-adhering countries must cease unless they carried similar official certificates. He considered this a great step in the right direction and thought that the Convention might subsequently be extended to cover field and planters' crops, which were at present outside its scope.

Mr. Fletcher pointed out that the Convention would be no safeguard against the introduction of many insect pests which could easily escape detection by the Inspector. Fumigation on entry was the only remedy in these cases.

Dr. Butler said that there was nothing in the Convention to prevent fumigation after entry. Mr. Fletcher then pointed out that the lists of insects to be kept out would be difficult to prepare for any particular crop, as a pest of fruit trees might come in on ornamental plants or *vice versâ*. Also a pest that did little harm in one country might be destructive to the same plant in another country, as was the case with cotton boll-worm.

Dr. Butler considered that the clause in the Convention requiring that any pest listed should be very harmful was a weak point. Several of the clauses required improving but he thought that what would happen was that, in view of the criticisms to which the Convention was being subjected in several countries, a new one would be signed after the war. He felt sure that the matter would not be altogether dropped and that countries that did not join in the movement would find themselves at a disadvantage.

Mr. Anstead enquired how the present Indian Destructive Insects and Pests Act would be affected.

Dr. Butler said that so far as he could see the Convention would not affect our Act, which would be supplementary to it. It would simply make it easier for us to get certificates under our Act, since every adhering country would be obliged to maintain an efficient inspecting staff.

A discussion then took place regarding the extent and nature of the export of horticultural produce from nurseries in India and it was elicited that the export was probably small, both in quantity and value, but that exact returns were not available. It was suggested that such returns should be obtained if possible. Members also undertook to make local enquiries regarding the nursery trade in their respective areas so as to be in a position to advise on the working of the Convention if India adhered. It was also suggested that a survey of the insect and fungus pests of plants should be kept up, so that the lists required under the Convention could be prepared if occasion arose.

The sixth meeting of the Mycological Conference took place on Saturday, February 10th, at 2 P.M., Dr. Butler in the chair. Mr. Robertson Brown, Agricultural Officer, North-West Frontier Province, was present in addition to the other members.

The Chairman asked Mr. Robertson Brown to give some account of mycological troubles in the North-West Frontier Province.

Mr. Robertson Brown said that the peach was the most important fruit crop in the North-West Frontier Province and leaf-curl was its most serious disease. The disease was worse in a rainy spring with cold nights. An experiment had recently been carried out to see whether this disease could be controlled by spraying with Burgundy mixture or lime-sulphur as was done in Europe and the United States of America. He preferred "knapsack" sprayers, owing to the difficulty of wheeling larger sprayers about the orchard. If the spraying was a success there would most probably be a sale

of sprayers in the district. Plums on peach stocks did not get this disease.

A fruit spot of pomegranate was troublesome but the cause was obscure and required working out.

Polythrincium trifolii was a source of serious damage to *shaftal* (*Trifolium resupinatum*) if the crop was allowed to grow high. It was however usually cut back early, and so the fungus did little damage.

Bunt of wheat was a serious disease, especially on the variety known as Pusa 4.

The Chairman pointed out that treatment of this disease by seed immersion in copper sulphate was not always successful. In the cold climate of the North-West United States of America the spores remained alive in the soil and disease was spread by soil infection—not by seed infection. In such areas the only way of combating this disease was to grow immune varieties which germinated quickly.

Mr. Robertson Brown said that a disease of chillies had caused great loss in Peshawar valley, the cause being obscure. Mr. Dastur said that he had examined specimens and the disease was not anthracnose. Dr. Shaw said that a species of *Fusarium* had been obtained from roots of diseased plants but infections had not succeeded. It was very possible that the disease was a *Fusarium* wilt, but further work was needed.

The Chairman said that at the last meeting of the Mycological Conference he would like to thank all those who had come from other parts of India and had helped to make the meeting so interesting and successful. The Conference then terminated.

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